

and stated how they had probably originated. Mr. JAMES NEILSON exhibited *Myalina redestalensis*, *Nautilus tuberculatus*, *Meekella cylindrica*, and *Meekella senilis*. The first named, from the Waulkmill Glen, is a species new to Scotland, and one specimen reaches $4\frac{1}{2}$ inches in length. Mr. Neilson also gave an account of the light that these and other fossils threw on the conditions that obtained when the deposits were being formed. Mr. G. W. TYRRELL, A.R.C.Sc., and Mr. N. MARTIN, B.Sc., A.G.T.C., read a paper entitled "The Geology and Petrology of the Auchineden District, Kilpatrick Hills, with special reference to new sections exposed in the Clydebank Waterworks at Burn Crooks." [See *Transactions*, vol. xiii., pp. 322 and 337.]

(Signed) JOHN RENWICK.

SOCIETY'S ROOMS, 207 BATH STREET, 27TH MAY, 1909.

The ninth meeting of the fifty-first Session of the Geological Society of Glasgow was held here this evening—Mr. JOHN RENWICK, V.P., in the chair.

The Minutes of the previous meeting were read and adopted.

The following members were elected :—

As Ordinary Member—Rev. A. Scott Mathieson, 7 Lynedoch Crescent, Glasgow, proposed by Mr. James Neilson and Mr. Peter Macnair.

As Associate Member—Mr. J. Wilson Massie.

Mr. ROBERT BOYLE, B.Sc., A.G.T.C., read a paper entitled "The Economic and Petrographical Geology of the New Red Sandstones of the South of Scotland, with their Associated Breccias." [See *Transactions*, vol. xiii., p. 344.]

EXCURSIONS FOR SEASON 1909.

To Kelvingrove Museum, on Saturday, 13th March—Mr. Peter Macnair, F.R.S.E., F.G.S., conductor. The party met in the Geological Gallery at 3 p.m. They then examined the recent additions to the geological collection, including the Melven Collection of Old Red Sandstone and Secondary Fossils from the North of Scotland.

To the Hunterian Museum, on Saturday, 27th March—Prof. J. W. Gregory, D.Sc., F.R.S., conductor. The party met at the Hunterian Museum, Glasgow University, at 3 p.m.

To Brodick, Arran, on Monday, 12th April (Spring Holiday)—Mr. James W. Reoch, conductor. The object of the excursion was to examine part of the Tertiary Volcanic Vent occurring in the centre of the island. The party proceeded by Invercloy, viewing the Lower Triassic rocks exposed on the shore, and thence to Brodick School, where a sill of pitchstone was examined. Proceeding by the String

Road, the vertical beds of Old Red Sandstone were traversed southward to the Carboniferous formation, and the outcrop of the Carboniferous Limestone followed, leading on to the intrusive quartz-porphry of Windmill Hill summit. Thence the party proceeded around the head of Glen Ormidale, skirting the eastern edge of the vent, where the intrusions of granite, granophyre, quartz-diorite and diorite were examined, descending into Glen Dubh, where very fine examples of moraines occur; and returning down Glen Cloy to Brodick.

To Corrieburn, Stirlingshire, on Saturday, 24th April—Mr. James Anderson, conductor. The chief attraction is the extensive lime workings, where the Hurler and Campsie series were largely worked in former times. The series were here found very fully developed, and also associated with valuable bands of limestone and ironstone, which have not been noted in any other locality. Overlying the lime series is a singularly fine exposure of brown shale, with regular bands of nodular ironstone concretions. The relationships of the sedimentary series to the volcanic deposits of the range are also to be studied under favourable conditions.

To Ardrossan and Saltcoats, Ayrshire, on Saturday, 1st May—Mr. John Smith, conductor. Part of the Lower Ironstone series and trap with sandstone dykes on the shore at Ardrossan were examined. Passing over the sands to Saltcoats, a part of the Upper Limestone series was seen, and between it and the Coal Measures there are volcanic ashes with a bed of ironstone. The lower part of the Lower Coal Measures has been invaded by sills which have charred some coal beds, and the strata present interesting features of contact metamorphism.

To Tyndrum, Perthshire, on Thursday, 20th May (Victoria Day)—Mr. Peter Macnair, F.R.S.E., F.G.S., conductor. After arriving at Tyndrum, the party examined the section exposed in the Allt nan Sae, which shows the Ben Lawers Phyllites faulted against a series of quartzites. Crossing the sides of Meall Odhar, the old workings of the Tyndrum Lead Mines were then examined. Specimens of Galena, Zinc-blende, Quartz, Pyrites, and other minerals occur here. On the walk between Tyndrum and Crianlarich the outcrops of the Garnetiferous Schists, Loch Tay Limestone, and associated epidiorites were examined.

To Duncomb, Kilpatrick Hills, Dumbartonshire (joint excursion with the Natural History Society of Glasgow), on Saturday, 22nd May—Mr. L. Watt, conductor. To the north of Kilbowie the party passed over a line of very deep drift supposed to be a buried river channel, and proceeded by Faifley, to the south of which the Hurler Limestone and Coal crop out. Half a mile north of Faifley the Carboniferous Limestone series, dipping gently southward, is faulted against the bedded lavas of Calciferous Sandstone age forming the Kilpatrick Hills. These were traversed up the course of the Loch Humphrey Burn (where in places they show glaciation from the north-west) to the reservoir at Greenside, and thence over the moor to Duncomb (1313 feet), the summit of which is a plug of intrusive felsstone. Zeolites occur in cavities in the lavas. The view from Duncomb in clear weather is extensive and very fine.

To Burn Crooks Waterworks, Auchinaden Hill, and the Whangie, Dumbartonshire, on Saturday, 29th May—Mr. N. Martin, A.G.T.C., and Mr. G. W. Tyrrell, A.R.C.Sc., conductors. Good sections have recently been opened in the Calciferous Sandstone lavas of Auchinaden Hill. At Burn Crooks excavations are proceeding in a plug of olivine basalt which overspreads a partially concealed volcanic "neck." In Burn Crooks and its tributaries can be seen good

agglomerate and tuff, with Calciferous Sandstones, dykes, &c. The great landslip known as the Whangie was visited in the course of the excursion. Good sections in boulder-clay, thick peat, &c.

To Shettleton, Glasgow, on Wednesday, 2nd June—Mr. James L. Begg, conductor. The objects of the excursion were to examine (1) an exposed section of the Upper Coal Measures at Shettleton Station, (2) some igneous sills near the Canal, and (3) a carried trap boulder exposed in a burn near Barrachnie.

To Murroch and Auchencroch Glens, Dumbartonshire, on Saturday, 12th June—Mr. David Chalmers, conductor. Lofty sections of the Ballagan group of shales and cement stones are exposed in the glens, with several intrusive dykes. Fine examples of stream erosion. Minerals—Fibrous Gypsum (pure white) and Celestite.

To Seedhills Clayfield, Paisley, on Wednesday, 16th June—Mr. Duncan Smith, conductor. The object of the excursion was to examine the Post-Tertiary Deposits occurring in the clayfield, consisting of surface soil, earthy clay, yellow stony clay, black clay with an abundance of shells, &c., and laminated sandy clay. The total depth of the cutting is about 28 feet, and, as the surface datum is about 30 feet above sea-level, the lowest part of the section is thus about coincident with the sea-level. Stones of various kinds—granite, grit, sandstone, limestone, porphyrite, basalt, &c.—are in greater or lesser evidence.

To Finnich and Dhu Alt Glens, Dumbartonshire, on Saturday, 26th June—Mr. William Sinclair, conductor. These very beautiful glens present fine examples of river erosion in the Red Sandstones, Calciferous Series. Finnich Glen is one of the finest cañons in the West—quite unique in its way—and shows river caldrons high up in the cliffs.

To Garngad, Glasgow, on Wednesday, 30th June—Mr. James Neilson, conductor. The quarries which are immediately to the east of Garngad Road Station, N.B. Railway, were visited. These have been opened in strata of Millstone Grit age, which here consist of sandstones—mostly soft—shales, cannel and free coal, coarse ironstone, and fireclay. The sandstones are crushed for use as moulders' sand, and the other strata used in the manufacture of bricks. The quarries show both thick and thin beds which are frequently faulted. In the adjoining railway cutting were found Roman Cement and marine shales, overlying which were found various sandstones containing marine fossils, these strata all underlying the quarries; while in the shales in the Garngad Road quarry were found various marine shells. The whole shows a transition state, in which the marine conditions were slowly passing away, to be replaced by the freshwater series characteristic of Upper Carboniferous times. The fossils also show a transition state. The American genera of shells, which have been found near Glenboig, should be looked for here, while the American genus "*Meekella*" has been identified from this locality. (See *Trans.*, vol. v., p. 222. At this time the southmost of the two quarries, viz., the Blochairn quarry, had been opened.)

To Mauchline, Ballochmyle, and Ayr Water, on Saturday, 3rd July—Mr. Robert Boyle, B.Sc., conductor. The objects of the excursion were (1) to visit the Ballochmyle quarries, worked to a depth of 200 feet at the eastern edge of the basin of Permian (?) brick-red sandstone; (2) to examine the igneous intrusion of later age at Howford bridge, and the ash interbedded in the sandstone; (3) to inspect the gorge of the Water of Ayr west of this. The depth at some parts is about 100 feet. There are excellent sections showing the amygdaloidal melaphyres and tuff at the base of the red sandstone, and also intercalated with it. The striking characteristic of the sandstone everywhere is its abundant false-bedding. The scenery is exquisite.

To Thornton Hall and Hairmyres, Lanarkshire, on Saturday, 7th August—Mr. James Neilson, conductor. The strata here consist of the upper members of the great volcanic series of Calciferous Sandstone age, which, during a period in which the land slowly sank, became first the shore and then the sea-bottom on which what are perhaps the earliest of our marine remains were laid down. The quarries visited, and which are still wrought, are fully described in two papers in the Society's *Transactions*, vol. iv., p. 276, and vol. ix., p. 282. They contain limestone, marine shale, oil shale with fish remains, entomostracan shale, fireclay with Stigmarian roots, ironstone, and volcanic ash, and at various times have freely yielded fossils—many finely preserved—including remains which have been supposed to belong to reptiles (although this is doubtful), as well as fishes, both marine and freshwater, mollusca, entomostraca, and land plants.

To Fiddler Gill, Crossford and Tillietudlem, Lanarkshire, on Saturday, 21st August—Professor Daniel Burns, M.I.M.E., conductor. The main features to be observed are outcrops of Shelly and *Productus* Limestones, Terra Cotta clay-beds, *Productus punctatus* ironstone beds, outcrops of Main and Lingula Limestones, and good exposures of underlying fossiliferous shales, gas coal series. Fossils may be collected at most of the places.

To Innellan and Dunoon, Argyllshire, on Saturday, 11th September—Mr. Peter Macnair, F.R.S.E., F.G.S., conductor. The Highland boundary fault enters the Firth of Clyde near Innellan Pier. Along the shore to the south there is a fine exposure of the Upper Old Red Sandstone conglomerates, sandstones, and cornstones. Near the line of fault a band of serpentine occurs. To the north of the fault line, and between Innellan and Dunoon, the following schist zones are exposed:—The Innellan Phyllites, the Bull Rock Greywacke, and the Dunoon Phyllites. The schists exhibit many interesting structural features, due to dynamic metamorphism. Both the schists and sandstones are traversed by numerous volcanic dykes.

To Carronbridge, Dumfriesshire, on Monday, 27th September (Autumn Holiday)—Mr. John Smith, conductor. After leaving Carronbridge Station a bit of Permian strata was passed over. At the mouth of Dalveen Pass there are mounds of drift, and in the Pass accumulations of gravel are taking place. Going up the Carron Water Silurian rocks were seen, mostly on edge, with some conglomerates. Passing through the Mid Pot—a dry river channel—Enterkin Glen was reached. Skirting round the steep sides of the Steygail, and going down the Enterkin Burn, the party reached Glen Valentine, where Carboniferous strata rest on the upturned edges of the Silurian rocks. Near this there are some good exposures of melaphyres. The famous and beautiful "Durisdeer Marbles" were inspected during this excursion.

To Gryfe Valley, Bridge of Weir, Renfrewshire, on Saturday, 16th October—Professor J. W. Gregory, D.Sc., F.R.S., conductor. The object of the excursion was to examine the Lower Carboniferous Limestone series, including the Hosie and Hurllet Limestones, faulted down against the Calciferous volcanic series.